Claims

1. Method of moving the rotating means of a wind turbine during transportation, said method comprising the steps of:

securing at least one auxiliary device to a fixed position in relation to said rotating means,

connecting said at least one auxiliary device to the rotating means at the transportation, said least one auxiliary device being able to store, generate and/or convert energy during transportation,

transferring energy from said at least one auxiliary device to said one or more shafts of the rotating means during transportation, and

moving said one or more shafts of the rotating means continuously or discontinuously from a position to another.

2. Method of moving the rotating means according to claim 1, wherein said rotating means is included in a nacelle of a wind turbine or in a transportation frame construction.

3. Method of moving the rotating means according to claim 1 or 2, wherein said auxiliary device is connected to one or more shafts such as the high-speed shaft at the gear and/or the generator.

4. Method of moving the rotating means according to any of claims 1 to 3, wherein the moving of said one or more shafts are turned at a very low turning speed such as less than one full turn per week e.g. between 1 and 20 degrees per day.

5. Method of moving the rotating means according to any of claims 1 to 4, wherein the moving of said rotating means is discontinuous e.g. between 30 seconds and 20 minutes of movement every period such as 1 minute movement every 3 hours.

6. Method of moving the rotating means according to any of claims 1 to 5, wherein the moving of said one or more shafts of the rotating means is combined with oil lubrication at said rotating means.

7. Method of moving the rotating means according to any of claims 1 to 6, wherein said method activates or controls one or more oil lubrication pumps supplying lubrication to said rotation means.

8. Method of moving the rotating means according to any of claims 1 to 7, wherein said auxiliary device and/or said one or more oil lubrication pumps is activated or controlled continuous or discontinuously.

9. Method of moving the rotating means according to any of claims 1 to 8, wherein said transportation is performed with transportation means such as trucks, trains or ships.

10. Method of moving the rotating means according to any of claims 1 to 9, wherein said auxiliary device is connected to one or more energy generating systems of said transportation means such as the electric generators, pneumatic or hydraulic pumps.

11. Method of moving the rotating means according to any of claims 1 to 10, wherein said auxiliary device is connected to said rotating means before start of the transportation.

12. Method of moving the rotating means of a wind turbine during stand still, said method comprising the steps of:

at least one auxiliary device being secured to a fixed position in relation to said rotating means and connected to the rotating means, said at least one auxiliary device being able to store, generate and/or convert energy during stand still,

transferring energy from said at least one auxiliary device to said one or more shafts of the rotating means during stand still, and

moving said one or more shafts of the rotating means continuously or discontinuously from a position to another.

13. Method of moving the rotating means according to claim 12, wherein said rotating means is included in a nacelle of a wind turbine or in a transportation frame construction.

14. Method of moving the rotating means according to claim 12 or 13, wherein the moving of said rotating means are turned at a very low turning speed such as less than one full turn per week e.g. between 1 and 20 degrees per day.

15. Method of moving the rotating means according to any of the claims 12 to 14, wherein the moving of said rotating means is discontinuous e.g. between 30 seconds and 20 minutes of movement every period such as 1 minute movement every 3 hours.

16. Method of moving the rotating means according to any of claims 12 to 15, wherein said auxiliary device is connected to one or more separate energy generating systems such as the public electricity grid.

17. Method of moving the rotating means according to any of claims 12 to 16, wherein said method activates or controls one or more oil lubrication pumps supplying lubrication to said rotation means.

18. Method of moving the rotating means according to any of claims 12 to 17, wherein said auxiliary device and/or said one or more oil lubrication pumps are activated or controlled continuous or discontinuously.

19. Method of controlling the moving of the rotating means of a wind turbine during transportation or stand still, said method includes

control and monitoring system including an algorithm, said system comprising inputs signal from one or more of sensors,

controlling at least one auxiliary device with output signals of said control and monitoring system in order to move the rotating means of the wind turbine during transportation or stand still,

wherein said output signal is derived from said input signals and/or time signals.

20. Method of moving the rotating means according to claim 19, wherein said sensors may include energy level monitoring means monitoring the remaining energy of the energy storage or storages, temperature sensors monitoring external and/or internal temperature of one or more components, pressure sensors monitoring the oil lubrication pressure levels, one or more vibration sensors and/or sensor combinations thereof.

21. Method of moving the rotating means according to claim 19 or 20, wherein said rotating means is part of a nacelle of a wind turbine.

22. Method of controlling the moving of the rotating means according to any of claims 19 to 21, wherein the time signals reflect the period or periods of stand still of said rotating means.

23. Method of controlling the moving of the rotating means according to any of claims 19 to 22, wherein the turning speed of the rotating means is lowered or converted from a continuous to a discontinuous drive at low energy levels by the control system.

24. Method of moving the rotating means according to any of claims 19 to 23, wherein said method activates or controls one or more oil lubrication pumps supplying lubrication to said rotation means.

25. Method of moving the rotating means according to any of claims 19 to 24, wherein said system activates or controls said auxiliary device and/or said one or more oil lubrication pumps continuous or discontinuously.

26. Nacelle for a wind turbine defining an enclosed space, said nacelle comprising

rotating means such as gear (17) and/or generators (21) including one or more shafts (16, 19), and

at least one auxiliary device (14) being secured to a fixed position in the nacelle with securing means (18, 28) and connected to said rotation means with connection means (15),

wherein said auxiliary device (14) moves the rotating means of the wind turbine nacelle during transportation or stand still of said wind turbine nacelle.

27. Nacelle for a wind turbine according to claim 26, where said connection is established to one or more shafts (16, 19, 32) of said rotation means such as the high-speed shaft (16, 32) at the gear (17) and/or generator (21).

28. Nacelle for a wind turbine according to claim 26 or 27, where said connection means (15) is a belt arrangement including a belt (15), belt pulleys (24b) at said

one or more shafts (16, 19, 32), at least one bracket (28) secured to a position in the nacelle and a belt pulley (24a) of said at least one auxiliary device (14).

29. Nacelle for a wind turbine according to any of claims 26 to 28, where the gear and/or the generator belt pulleys (24b) have different sizes in relation to belt pulley (24a) of said at least one auxiliary device (14) e.g. being significantly larger in diameter.

30. Nacelle for a wind turbine according to any of claims 26 to 29, where said connection means is a cardan coupling system (25) flexibly connecting the high-speed shaft ends (32) of the gear and/or the generator with said at least one auxiliary device (14).

31. Nacelle for a wind turbine according to claim 30, where said cardan shaft system (25) includes gearing means (27) in the connection between the shafts and said at least one auxiliary device (14).

32. Nacelle for a wind turbine according to any of claims 26 to 31, where the transportation is performed with transportation means (6) such as trucks, trains or ships.

33. Nacelle for a wind turbine according to claim 32, where the auxiliary device is connected to one or more of the energy generating systems of the transportation means (6) such as the electric generators, pneumatic or hydraulic pumps.

34. Nacelle for a wind turbine according to any of claims 26 to 33, where the rotating means is mounted on the nacelle (3) with flexible rubber bushings.

35. Nacelle for a wind turbine according to any of claim 26 to 34, where the nacelle further comprises one or more oil lubrication pumps (20) supplying lubrication to said rotation means.

36. Auxiliary device (14) for moving the rotating means of a wind turbine during transportation or stand still of said wind turbine, said device comprising

securing means (18) for securing the auxiliary device (14) to a fixed position in relation to said rotating means,

connection means (15) for connecting the auxiliary device (14) to the rotating means

converting means for converting an internal or external energy source to mechanical force,

where said connection means (15) continuously or discontinuously transfers the mechanical force to the rotating means through said connection to the rotating means.

37. Auxiliary device (14) according to claim 36, where the connection means (15) is connected to the shaft of the rotating means such as the high-speed shaft (16, 32) of the gear (17) and/or the generator (21).

38. Auxiliary device (14) according to claim 36 or 37, where said connection means (15) is a belt arrangement including a belt (15), belt pulleys (24b) at said one or more shafts, at least one bracket (28) secured to a position in the nacelle and a belt pulley (24a) of said at least one auxiliary device (14).

39. Auxiliary device (14) according to any of the claims 36 to 38, where the gear and/or the generator belt pulleys (24b) have different sizes in relation to belt pulley (24a) of said at least one auxiliary device (14) e.g. being significantly larger in diameter.

40. Auxiliary device (14) according to claim 36, where said connection means is a cardan coupling system (25) flexibly connecting the high-speed shaft ends (32) of the gear and/or the generator with said at least one auxiliary device (14).

41. Auxiliary device (14) according to claim 40, where said cardan shaft system includes gearing means (27) in the connection between the shafts (32) and said at least one auxiliary device (14)

42. Auxiliary device (14) according to any of claims 36 to 41, where said internal or external energy source may be selected from a first group of energy sources comprising:

motors supplied with electric power,

engines fuelled with diesel, gasoline or other fossil fuels,

helical or leaf spring means or torsion bars, or

pneumatic or hydraulic systems supplied with compressed air or hydraulic oil, respectively.

43. Auxiliary device (14) according to any of claims 36 to 42, where said internal or external energy source may be selected from a second group of redundant energy sources comprising:

electric accumulators,

pneumatic or hydraulic storages,

and/or

solar cells such as movable carpets of solar cells.

44. Auxiliary device (14) according to any of claims 36 to 43, where said auxiliary device (14) is connected to said rotating means before start of the transportation or stand still.

45. Control and monitoring system (34) for controlling the moving of the rotating means of a wind turbine (1) with at least one auxiliary device (14) during transportation or stand still, said system comprising

input signals from one or more sensors,

at least one time signal generator, and

one or more algorithms

where said at least one auxiliary device (14) is controlled with output signals from said one or more algorithms in order to move the rotating means of the wind turbine during transportation or stand still, said output signal being derived from said input signals.

46. Control and monitoring system (34) according to claim 45, where said one or more sensors may be energy level monitoring means monitoring the remaining energy of the energy storage or storages, pressure sensors monitoring the oil lubrication pressure levels, temperature sensors monitoring external (ES) and/or internal temperature of one or more components, one or more vibration sensors (ES) and/or sensor combinations thereof.

47. Control and monitoring system (34) according to claim 45 or 46, where said system further controls and monitors one or more oil lubrication pumps (20) supplying lubrication to said rotation means.

48. Control and monitoring system (34) according to any of claims 45 to 47, where said system activates or controls said auxiliary device (14) and/or said one or more oil lubrication pumps (20) continuous or discontinuously.

49. Control and monitoring system (34) according to any of claims 45 to 48, where said system further transmits output information signals regarding the transportation or stand still e.g. alarm or fail signals to one or more remote places such as a remote control center (35).

50. Control and monitoring system (34) according to claim 49, where said output information signals may include data identifying the nacelle (3) or the rotating means, the reason for the alarm or fail signal and preferably the position of the nacelle.

51. Control and monitoring system (34) according to claim 49 or 50, where said output information signals are wireless signals such as using mobile telephone systems together with GPS systems or satellite based maritime communication systems.

52. Use of an auxiliary device according to any of claims 36 to 44 and/or control and monitoring system according to any of claims 45 to 51 as a unit for supplementary connection to one or more shafts (16, 19, 32) of rotating means in a wind turbine (1) at transportation or other types of stand still.

53. Use according to claim 52, where said unit is connected to the high-speed shafts (16) of the gear (17) and/or generator (21).